

## Custom TMJ Hemi-joint Fabrication Process

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Temporomandibular joint disorder afflicts 10 million Americans, many of whom have osteoarthritis of the temporomandibular joint (TMJ). This condition can inflict severe pain and disrupt the lives of sufferers in many ways. Partial or total replacement of the temporomandibular joint is a last resort treatment option. Surgeons at Mayo Clinic believe a new hemijoint implant design coupled with unique surgical technique can improve joint kinematics and reduce pain. They are currently investigating a patent-pending implant design in a series of patient trials. The Division of Engineering at Mayo Clinic has developed a novel process for fabricating TMJ implants for this study. Computed Tomography

(CT) images of the surgical site are first converted into a 3D computer model of the mandibular fossa and condyle area. A fused deposition modeling process is used to create a plastic model of the anatomy, and the surgeons use that model to create a wax mold of the implant. The wax mold is laser scanned to create a 3D CAD model that can be machined with a standard four axis milling machine out of implant grade CoCrMo material. Because of the unique shape of the implant, the machining takes place in two phases, with the implant being refixtured between machining phases using a high strength industrial adhesive. Finally, the implant is polished, inspected, passivated and sterilized for surgery. This fabrication process has allowed Mayo Clinic surgeons to quickly and accurately test their unique implant design.